

Training healthcare professionals to be ready for practice in an era of social distancing: A realist evaluation

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Abstract

Background

Programme changes due to the COVID-19 pandemic have impacted variably on preparation for practice of healthcare professional students. Explanations for such variability in outcomes between institutions and healthcare professions have yet to be explored. The aim of our study was to understand what clinical learning, whilst under socially distanced restrictions, worked and why (or why not).

Methods

We conducted a realist evaluation of the undergraduate healthcare programmes at one UK university in 2020-21. The initial programme theories to be tested in this study were derived from discussions with programme leads about the changes they implemented due to the pandemic. Study participants were students and teaching faculty. Online interview transcripts were coded, identifying why the interventions in the programme had worked or not. This resulted in a set of 'context-mechanism-outcome' (CMO) statements about each intervention. The initial programme theories were refined as a result.

Results and discussion

29 students and 22 faculty members participated.

18 CMO configurations were identified relating to clinical skills learning and 25 relating to clinical placements. Clinical skills learning was successful whether in person, remote or hybrid if it followed the steps of: demonstration – explanation – mental rehearsal – attempt with feedback. Where it didn't work there was usually a lack of observation and corrective feedback. Placements were generally highly valued despite gaps in experience. Being useful on placements was felt to be good preparation for practice. Participant explanations from junior students about the value of various modes of induction to clinical workplace activity may also be relevant post-pandemic.

Background

The increased need for hospitalisation with COVID-19 exceeding many countries' everyday healthcare capacity and the associated high death rate caused governments to enforce social distancing and self-isolation strategies to reduce the spread of the virus. While this had implications across many sectors, education both within schools and higher education was greatly affected in the UK and globally, not least for the training of healthcare professional students.

When UK higher education programmes (including healthcare) sent students home for online delivery of learning in March 2020, some final year healthcare students were offered the opportunity to move in the opposite direction to support the workforce by taking up intermediary clinical roles with new supplementary roles created for more junior students. Many did, if they were not clinically vulnerable or

providing home schooling and care for family, including 28,108 student nurses and student midwives(Health Education England, 2020).

As the pandemic continued longer than anticipated, some senior healthcare students were allowed to recommence placement while junior years remained online. This move was in line with guidance from governing councils who emphasised the need to restart clinical education with particular emphasis on ensuring preparedness of final year students while first- and second-year students were to continue studying online (Medical Schools Council, 2020; Medical Schools Council & General Medical Council, 2021). While medical and nursing governing bodies encouraged student deployment, a joint report from Health Education England and the Royal Pharmaceutical Society discouraged this in favour of students focusing on their studies (Health Education England et al., 2020).

Programme changes due to the pandemic have impacted variably on preparation for practice of healthcare students. We reviewed articles published between March 2020 and May 2021 which indicated that students have missed a significant portion of their clinical training but expressed conflicting opinions regarding their level of preparedness. A national survey of final year UK medical students highlighted that 59.3% of respondents felt less prepared to start work as a doctor in August 2020 as a result of the changes COVID-19 brought to their training programmes (Choi et al., 2020). Physiotherapy students felt disadvantaged by the move to online learning (Chesterton et al., 2022). Comparatively, an international survey of medical students found only 30% were concerned that training during the COVID-19 pandemic would reduce their ability to give high quality care (Brown et al., 2021). Similarly for radiography students, a qualitative analysis of final years joining practice early found they were more prepared for practice than they previously believed and felt that the pandemic had increased their clinical confidence (Cushen-Brewster et al., 2021).

Healthcare students have strict requirements of skills and proficiencies that must be acquired prior to graduating. With COVID-19 limiting clinical time and reducing the opportunity to undertake certain tasks, nursing students have expressed dissatisfaction with their school and governing body for the inflexibility in requirements for competency sign-offs (Ulenaers et al., 2021). In this study, although 53% believed clinical experience during COVID-19 had enriched their training compared to 20% who found it to be a limitation, nursing students stated that in certain specialties there were little to no opportunities for practicing skills and were concerned about the effect on their preparedness. This gap in clinical skills represents a potential challenge to preparedness or implications for future placements if remediation is required.

With clinical placements curtailed, innovations to supplement clinical learning at a distance evolved. Of these, simulation - already a well-received and popular tool across the healthcare sciences - was expanded by some programmes to give students clinical exposure without patient interaction (Almohammed et al., 2021; Jiménez-Rodríguez et al., 2020; Kasai et al., 2021). Medical students taking part in simulated management of common clinical scenarios unanimously agreed in a self-evaluation that simulation increased their clinical preparedness (Kasai et al., 2021). Similarly, 70% of pharmacy

students agreed the bespoke simulated training course was beneficial to their future practice (Almohammed et al., 2021).

The need to innovate during the pandemic has resulted in trialling of new technology that could improve upon traditional clinical learning. One such method includes the use of a modified reality (MR) lens which allowed medical students to remotely participate in ward rounds (Bala et al., 2021). Despite the small sample group, students agreed MR allowed access to clinical learning otherwise unavailable due to COVID-19 and in fact made understanding and participating easier due to reduced crowding. Another key technology is the utilisation of telehealth. Feedback from twelve medical students enrolled in a supervised e-Consultation course involving real patients showed how students valued the opportunity to work collaboratively with doctors and believed the experience promoted engagement with learning (Kopp et al., 2021). Specifically, these students reported that they missed working collaboratively with and learning from doctors in clinical settings due to the increased demands of COVID-19 limiting teaching opportunities. Social distancing has also affected interprofessional learning. This prompted the development of a small-scale telehealth interprofessional programme in which all pharmacy and medical students working collaboratively agreed the experience had increased their practical confidence (Bautista et al., 2020). While involvement of students in telehealth has been limited, the positive experiences in these studies suggest it could be a key method to supplement socially distanced clinical learning.

Alongside providing proof-of-concept, some have evaluated their innovations in terms of promoting preparedness compared to traditional learning methods. One study investigating the use of tele-simulation with paediatric scenarios found that despite 90% of medical students feeling more confident and knowledgeable post-simulation, a majority of staff did not believe it was superior to face-to-face interactions (Yang et al., 2020).

Evidence is emerging that deployment of nursing and medical students to support the workforce was challenging for some, especially initially (Goni-Fuste et al., 2021; Griffin & Riley, 2022) but in other studies volunteering within the workforce was highly beneficial for aspects of clinical preparedness (Ali et al., 2021; Chawłowska et al., 2021; Coster et al., 2022). Involvement of medical students during the pandemic appears to have benefitted multidisciplinary relations and promoted patient centred behaviour (Nolan & Owen, 2021). Interestingly this was mirrored by nursing students who felt nurse-doctor communication had improved because of COVID-19 (Ulenaers et al., 2021). A prominent theme among surveys of student opinion on clinical practice in COVID-19 is a keenness to support the health service and contribute to the community (Byrnes et al., 2020; Choi et al., 2020; Nolan & Owen, 2021; Siqueira et al., 2022). A large international survey of over 6000 medical students found that over half of respondents felt underutilised and were comfortable and enthusiastic to assist with the COVID-19 effort (Brown et al., 2021). This is further supported by an international questionnaire of over 10,000 medical students showing the most supported statements related to altruism in duty and willingness to accept risk in order to take part in clinical practice (Tempski et al., 2021). In fact, midwifery students who were not allowed into operating theatres expressed dissatisfaction at the lack of autonomy in this decision and were distressed at letting their patients down (Kuliukas et al., 2021). Nursing students in particular valued the opportunity to decide

for themselves whether they would like to continue placement, defer or be deployed (Ulenaers et al., 2021). Radiography students were offered the opportunity to take up either early registration or a paid assistantship prior to registration; those who took part in both expressed a number of benefits to clinical preparedness including teamworking skills, resilience and additional experience under supervision (Cushen-Brewster et al., 2021).

There was disparity between the healthcare disciplines in the extent to which they continued placements and offered deployment or moved students out of the clinical workplace and into alternative learning activities. Nursing students have seen the least disruption with one cross-sectional study reporting over half of respondents continuing with no changes and only 36% having to relocate to alternative placements (Ulenaers et al., 2021).

What is missing in the research into the impact of COVID-19 on healthcare students is explanations of why some are confident, satisfied and thriving while others are not. The disparate effects of COVID-19 on clinically vulnerable or mature students needs exploring. We found few original research articles reviewing the universal effects of COVID-19 across students of multiple healthcare professions and few studies of the impact of COVID-19 on clinical preparedness and education of pharmacy, physiotherapy and radiography students.

Aims

The aim of our study was to understand how we can best train healthcare professionals to be clinically ready in an era of social distancing. Specifically, we aimed to understand what teaching and learning of clinical skills and activities, whilst under socially distanced restrictions, worked for students and faculty and why (or why not).

Methodology And Methods

Seeking explanations of why socially distanced healthcare training works well for some students and not so well for others a realist approach to the research question was chosen. Realist evaluation utilises an iterative approach to testing, developing and refining initial programme theories (Pawson & Tilley, 1997; Wong et al., 2016). The aim is to investigate the contexts in which an intervention works and what conditions impact the outcome, be it in a positive or negative manner. Realism acknowledges that aspects of a context shape the way individuals respond to an intervention. The intervention will therefore produce various outcomes when implemented in different contexts through a fairly predictable set of human reactions (mechanisms). Realist evaluation asks 'what works for whom, under what circumstances, and how' and is often expressed in the formula $C+M=O$, where C = context, M = mechanism and O = outcome.

Contexts are defined as the conditions in which an intervention operates, predominantly socio-cultural but not exclusively. Mechanisms are the reasons for actions that people take in response to the intervention. For example, a student whose parent has recently died of COVID-19 (C) may find seeing the

patients (C) on an ICU placement (intervention) triggers painful memories (M) with a negative impact on wellbeing and their ability to learn (O).

The initial programme theories to be tested in this study were derived by the core research team meeting with the leads of each undergraduate pre-registration healthcare professional programme at Keele University. Before meeting we asked them to consider the question 'How is our curriculum going to get our graduates clinically ready in the socially-distanced learning environment?' and discussing with them the strategies (interventions) they were adopting and how (mechanisms) these strategies were intended to produce the required graduate readiness (outcomes)

The research team also drew on the governing body directives for medicine (General Medical Council, 2018), pharmacists (*Future Pharmacists Standards for the Initial Education and Training of Pharmacists*, 2011), physiotherapists (HCPC, 2013a), radiographers (HCPC, 2013b) and nursing and midwifery (*Future Nurse: Standards of Proficiency for Registered Nurses*, 2018; NMC, 2019) along with the Emergency Standards for Nursing and Midwifery Education (NMC, 2020) introduced in March 2020, some phased out Sept 2020, some reintroduced Jan 2021 and finally withdrawn Sept 2021. The initial programme theories are described before the results section. Initial programme theories about online group and self-directed learning were also developed and tested with participants and are the subject of a companion study.

Data collection

The study data was explanations from individuals of what worked and why in their experience of their undergraduate healthcare training programme since the onset of the pandemic. Participants were students and teaching faculty from each of the schools in the Faculty of Health at Keele University who were purposefully sampled to be interviewed. Faculty were identified by their head of programme and were invited by personal email. Clinical student year groups were contacted via email lists for each programme and respondents were accepted up to a limit proportionate to the size of their cohort.

Researchers were trained in realist interviewing and coding in June 2020. Interviews were conducted via Microsoft Teams between November 2020 and October 2021 by researchers who were from a different programme from the participants they interviewed. Interviews lasted approximately 40 mins and were audio recorded. A topic guide was used to guide the interview (see appendix 1), informed by the initial programme theory. Audio recordings were transcribed verbatim using an approved transcription service. All identifying data was removed.

This study was approved by the University ethics panel on 22.6.20 ref. KR-200021.

Analysis

Two researchers (the interviewer and a researcher from the participant's own school and therefore able to understand programme-specific contextual comments) independently coded each transcript looking for 'context-mechanism-outcome configurations' (CMOCs) relating to the interventions in the programme.

This resulted in a set of CMOc statements for each intervention. These statements with supporting quotes were exported into a spreadsheet. Each statement was colour-coded according to whether the intervention was working or not. Where an intervention was described as working for some individuals in some contexts but not in others, it was coded with both colours.

The final phase of the analysis consisted in determining which CMOc(s) offer the most robust and plausible explanation of the observed pattern of outcomes for each intervention. Similar CMOcs were grouped together by JL and NC and a merged statement was agreed for each group. These CMOc statements refined the initial programme theories.

Initial Programme Theories developed with the heads of programmes

In the **macro-context** of

- fear of COVID-19, social distancing rules, PPE in clinical practice and periods of self-isolation
- Regulatory Body requirements altering in some courses (reduced requirement for total hours to qualify for nursing and physiotherapy, but no reduced requirement for practical procedure sign-offs)

the modified undergraduate health professional programme activities **(C)** will work differently **(O)** for *various groups of students* **(C)** by the following learning processes or influences on student thinking and actions **(M)**:

1. Clinical skills learning

- Increased clinical skills learning and practicing by simulation, remote where possible and in-person when necessary (C), was predicted to mitigate for some of the lost clinical placement practice and would also reduce COVID-19 transmission to and from the clinical workplace. The traditional clinical skills learning mechanisms of observation, repeated deliberate practice and feedback (M)(Ericsson, 2004) (Giacomino et al., 2020) were expected to produce clinical competence (O) and self-efficacy (O).
- Social distancing in clinical skills classes (C) meant smaller groups, fixed student groups, briefer classes wearing PPE with no refreshment breaks. The outcomes were hoped to be equivalent to previous learning but this was uncertain.

2. Clinical placements

- Students were sent home from March to July 2020 (C). On their return, student numbers on each placement were reduced for social distancing (C). Programme leads theorized that when students were present, due to their small numbers they might get to do more (M), act more as team members (M) and take more responsibility (M), resulting in enhanced development of professional identity (O) and self-efficacy for clinical tasks (O).

Senior students (C) had priority and would therefore receive these benefits, conversely junior students (C) had reduced placement exposure and would miss these benefits (O).

Student risk assessment by Occupational Health scored them low-medium-high risk for severe complications should they catch COVID-19. Medium and high risk students were excluded from some or all clinical placements (C) so would also lose these learning opportunities (O).

- There was some remedial placement provision (C) but students who missed placement experience might have gaps in their training (O).
- Reduced socializing in the workplace (C) was expected to affect all students but especially those just starting clinical learning, as they would have reduced learning by informal role modelling (M) by near peers and senior colleagues. The outcomes predicted were delayed/ distorted development of professional identity (O).
- New ways of communicating remotely with patients and family members were to be promoted in the curriculum (C) and practiced by students on placements supported by tutors (M) to provide equivalent and currently-appropriate consultation skills training (O).

3. Deployment/Volunteering

- Health Education England asked schools to encourage emergency student contracts and NHS volunteering (these were entirely voluntary, not for all students and not counted as placements). Where students were deployed or employed as healthcare workers (C) this was expected to substantially mitigate the above impacts of reduction in placement exposure (M) and to enhance professional identity and team-awareness (O) COVID-19 awareness (O) and clinical skills (O). The students who were not able to be deployed/employed because they were clinically vulnerable (C) or had childcare responsibilities (C) or were junior (C) were expected to be most severely affected by being de-skilled (M) and suffer low self-efficacy (O).

4. Exposure at work and in the family to people very ill and dying with COVID-19 (C) was expected to be traumatizing (M) for some students with effects on mental health and resilience (O).

Results

We recruited 29 students and 22 faculty members for interview to help us to test the initial programme theories (table 1).

Table 1: Study participants by status (student or faculty) and by programme of study

Programme	Students	Faculty
Adult Nursing	5	2
Children's Nursing	1	1
Mental Health Nursing	2	2
Learning Disability Nursing	2	1
Midwifery	1	2
Physiotherapy	4	3
Radiography	2	2
Pharmacy	5	5
Medicine	7	4
Total	29	22

The CMOcs extracted from our data which are relevant to readiness for clinical practice are presented in Appendix 2. They are grouped into those relating to interventions for learning clinical skills and those relating to programme changes in clinical placements. Each CMOc explaining why the intervention worked or did not work for certain groups of students is illustrated in Appendix 2 by one or more quotes which are drawn from across the healthcare programmes. For ease of understanding causation in each CMOc statement, the intervention is identified in the statement, and the causative elements in both the intervention and the wider pandemic context are denoted by (C) to make clear what is causing the outcome(s) (de Weger et al., 2020). Participant ID after each quote indicates the participant's profession, whether they are faculty or student with year of study.

Learning clinical skills

Demonstration of the skill and explanation of theory were moved online followed by skills practice either online (for consultation skills) or in-person on training manikins, on peers, on household members, or directly on placement. In situ classes were for small socially distanced groups with no touch rules except for student pairs or 'bubbles'. All participants gave explanations of how aspects of this worked (or didn't work) for them and student colleagues, condensed into 18 CMOcs.

Learning skills theory and watching demonstrations online, then practice in person (CMOc 1.1)

Watching skills videos and learning the theory online relied on mechanisms of retention and retrieval when students came to the in-person practice. This worked for some skills (theory-heavy, less complex tasks) but not for others (more technical, less theory). Students came better prepared to practical sessions but found it difficult to go through some of the skills theory separate from the skill.

Skills learning moved from classroom to placement (CMOc 1.2)

Nursing students except for year 1 continued on placements but due to COVID-19 had to reduce in-person classes. Some skills were therefore allocated to be learned online or by written theory then applied directly in clinical placements for practice. It worked to an extent if the placement provided practice but the mechanisms of practicing skills in a safe environment and the personal reinforcement of feedback were missing, resulting in some students feeling unprepared to do skills on placements.

Skills classes in person but socially distanced and no touch rules for demonstration of skills (CMOc 1.3)

For physiotherapy and pharmacy students social distancing rules meant that staff were unable to demonstrate on students. Instead, students were permitted one partner to practice with and had to observe from a distance. This was universally felt to be a relatively ineffective learning experience by both students and tutors as it lacked the important mechanisms of effective demonstration and hands-on correction.

Peer examination (CMOcs 1.4.1 to 1.4.3)

Medical and physiotherapy students were 'bubbled' with the same students to peer examine. This worked for medical students learning examination techniques. Strict pairing for physiotherapy students meant they did not fully understand the subtle variation in anatomy, and when one student was self-isolating for 2 weeks they and their pair both missed practising.

Skills practice at home was also advocated. This worked if students lived with other students on the same course when they had already learned the skills, as they could hone technique and gain confidence. If the skill was new, the mechanism of expert corrective feedback was missing.

Smaller skills groups (CMOcs 1.5.1 and 1.5.2)

Social distancing requirements due to COVID-19 made smaller skills groups mandatory. This was universally successful for students getting more practice and more feedback, thereby increasing their confidence and feelings of preparedness. It did however mean the same cohort of students required more groups, with extra work for tutors including cleaning down between groups.

Consultation skills classes moved online (CMOcs 1.6.1 and 1.6.2)

For medical and pharmacy students, online consultations and handovers worked well. The observing tutor and class could become 'invisible' by switching their cameras off which enabled the interacting students to imagine the interaction was one-to-one. This was less daunting for students with lower confidence levels. Online didn't however feel quite authentic when simulating an in-person interaction.

High-fidelity (authentic) simulation (CMOcs 1.7.1. to 1.7.3)

Various high-fidelity simulations already being used for in-person simulations in radiography (a simulated Xray facility) and medicine (in-person SIM man, simulated on-call) were augmented by virtual simulations in pharmacy (a virtual patient and simulated pharmacy), medicine (Oxford Medical Simulator) and

radiography (a virtual control panel with shared controls via the online platform). The important mechanisms were authentic experience and practice, learning from feedback, and learning decision-making by having to decide. These simulations worked for junior (radiography) students who were more prepared when starting placements than students who learned theory only online. Senior students were prepared to take responsibility. Virtual simulation for medical and pharmacy students is less authentic than in-person simulation as it works by clicking buttons rather than speaking and laying hands on the patient, choosing from set questions rather than asking the questions you want to. Despite this, it was appreciated by pharmacy students (who were getting no other patient contact). It was deemed less educational than in-person SIM for medics but good to reinforce learning. Simulation was noted not to authentically match the workplace noise, smells and pressures. Junior students may be partly prepared for placements by simulation but not completely and may be shocked by reality. Pharmacy and physiotherapy students who missed placements were expected to need more support in their first jobs to find their feet.

Reduced or absent skills practice (CMOCs 1.8.1 to 1.8.5)

Although the initial plan was to increase simulation, this was not practically possible as COVID-19 rules restricted in-person teaching for universities. Staff self-isolating, home schooling and being needed in the clinical workplace also affected some courses more than others. Rather than the intended increase in simulation to replace placement activity, the reality for some programmes (physiotherapy, pharmacy and nursing) was less classroom skills practice time per student. Vulnerable students had skills remediation when they were no longer locked down but too late to get much practice. These students and their tutors noted the important loss of skills practice and feedback resulting in students feeling less prepared for placement. Outcomes were some proficiencies not getting signed off, reduced confidence and apprehension at the thought of qualifying and an expectation of needing support on starting work as graduates.

Clinical placements

The programme interventions to provide safe clinical experience for healthcare students were multiple and altered with time, responding to the changing risk levels and to the way the local healthcare trusts were working. The data contained 189 explanations from participants about what aspects of in-person and virtual clinical placements they felt had worked or not to prepare them or their student colleagues to be ready for their future clinical work and why. The commonly-occurring (robust) and plausible explanations are presented in 25 CMOCs 2.1.1 to 2.6.4:

Efforts made by programme leads to fill the gaps in the clinical experience required by regulatory bodies (caused by COVID-19 disruption to placements) (CMOCs 2.1.1 and 2.1.2)

The first COVID-19 lockdown caused a significant loss of placement exposure for some students before remediation started. Nursing students who had to accumulate placement hours, were required to experience particular clinical settings and to get competencies signed off this was a source of stress.

Despite various interventions, remediation was partial, patchy and often ad-hoc. Students with children to home-school were particularly affected. Students and their teachers expected additional support to be required (and provided). Topic-based remediation (for medical students) was easier to provide than hours-based remediation (for nurses). Year 1 nursing students had theory 100% of the time to replace their 50% missed clinical placements. This was not a success even in the context of COVID-19, as student nurses felt they needed placements to become clinically prepared.

Placements were still expected to provide the required clinical experience despite COVID-19 (CMOCs 2.2.1 to 2.2.3)

The patient mix, clinical activity and restriction of student access altered on some placements more than others. In the context of unchanged assessed intended learning outcomes and regulatory body requirements, the pressure of getting 29 nursing proficiencies signed off was a concern to mental health and learning disability nurses whose placements were not providing these opportunities. Radiography students were permitted to self-source placements which worked for those who could. For schools not permitted to send students on placements (pharmacy and physiotherapy) the extent of missing clinical experience and assessment opportunities and lack of confidence in using their knowledge was considerable and some were felt to require remediation (possibly some after qualification).

Students were made useful in the workforce (when on placement and also by encouraging deployment and volunteering) (CMOCs 2.3.1 to 2.3.4)

In the context of the need for work-ready graduates in the pandemic, final year medical assistantship placements, patient care on nursing placements and deployment of final year nurses on extended placements all facilitated work-readiness. The mechanisms were students performing the tasks of the healthcare professional (rehearsal), putting theory into practice, tailored to the patient and receiving constructive feedback from seniors (checking and rectifying). This consolidated the students' skills of knowledge, reasoning and decision-making. The outcome for deployed students was to become more confident and skilled when they joined the workforce after graduation, especially if they had been deployed in the location where they were about to have their first job. Students also reported sometimes helping out relatively unsupported because the pandemic had caused staff sickness and burnout. Although this put pressure on the students concerned, they were able to experience practice almost as they would when qualified and they valued the experience of taking responsibility.

Deployment and volunteering worked well to make students clinically prepared. Those students who did healthcare jobs paid or as volunteers gained exposure and were given responsibility as healthcare team members so they felt confident, satisfied training requirements although there was some competition between their educational needs and the workforce gaps they were filling. Some earned money as well as supporting the health service. Those who didn't (vulnerable, having caring responsibilities, lacking opportunity) were expected to lack confidence.

Alterations to placement activities due to COVID-19 (CMOCs 2.4.1 to 2.4.10)

New and detailed inductions of students familiarizing them with the COVID-19 clinical environment generally worked well to prepare them for what would be different on placements. However, for physiotherapy students who had no prior clinical exposure, clinical theory was felt not to 'click' until they met patients face to face, when their learning now had meaning. Students appreciated experiencing the realities of working in the health sector in the COVID-19 pandemic "people are stressed and people are worried, and people are understaffed and overworked". Students explained that this made them better prepared for working in the real world.

Social distancing rules (2m distance) and hospital rules of only one visitor per patient meant that student numbers and duration on placements were reduced, especially for junior students. This gave them limited experience and exposure and impacted students' experiences of some clinical areas.

Altered hospital case-mix affected all students but was especially difficult for radiography who had set assessed imaging and for physiotherapy who needed to learn to do body-system procedures.

Reduced clinical supervision and feedback by clinical staff during the COVID-19 pandemic affected the learning experience. Students acknowledged that this is part of the nature of the role and being able to adapt to that environment is part of training, but it was viewed as impacting students negatively in two situations – workplace assessment (some students found this problematic) and in medical student bedside teaching.

Remote consulting expanded in the COVID-19 pandemic and this had an impact on students on community placements in GP, Physiotherapy, Community Mental Health and Pharmacy where students were barred from home visits and consulting was mostly remote unless it was deemed essential to examine the patient. The context included new IT systems which were not working perfectly initially. Students learned by doing thorough histories by phone and gained IT skills but were not getting physical examination practice and missed patient contact, so their expectations of preparation for practice were not always met.

Virtual placements (CMOCs 2.5.1 and 2.5.2)

Pharmacy, physiotherapy and radiography students (and to a small extent medical students) had substitute virtual (group discussion with clinicians) placements to provide simulated clinical decision-making practice and exposure to clinical scenarios. They were felt to have some value but were only partial preparation as they lacked the hands-on nature of real practice. Junior students got more out of virtual placements and felt better prepared by them for subsequent placement practice of the basic topics rehearsed. Conversely, senior students and their tutors felt that virtual placements left them lacking in hands-on patient management skills and it was felt that pharmacy, radiography and physiotherapy graduates will need support. International students were particularly affected if they had a higher proportion of virtual to in person placements than their peers due to being out of the country. Also students who were struggling were thought to be going undetected on virtual placements.

Support for student wellbeing on placement (CMOCs 2.6.1 to 2.6.4)

University support services during the COVID-19 pandemic were appreciated but the challenge was considerable. Exposure at work and in the family to people very ill and dying with COVID-19, students having to cope with wearing full PPE and with the social isolation were among the main contexts which had effects on mental health and resilience. Support offered from student welfare (by email) and by supervising tutors and peer support had mitigating effects, but the university process for absence/extenuating circumstances was not perceived as geared towards the challenges faced.

Provision of COVID-19 testing and vaccination reduced fear of attending placement. In the early pandemic the fear of transmitting COVID-19 was greater for students with elderly family members at home, students with caring responsibilities, ethnic minorities and more vulnerable groups. Reassurance was provided by information and availability of COVID-19 testing and vaccine, role models and by habituation for those with a job outside the home. Later in the pandemic the realization that COVID-19 can't be avoided was a mechanism which operated positively in the context of provision of PPE, COVID-19 safety rules and training. When students were exposed to the hospital environment they generally felt that their wellbeing was prioritised, which enhanced their performance and learning experience during placement and trained them to work safely in a pandemic.

Risk assessments for students disadvantaged the medium- and high-risk individuals in terms of clinical preparedness, but was necessary to protect against COVID-19. Students assessed as vulnerable had some substitution of learning activities for placements and remediation later but they and their tutors felt that missing hands-on learning and the impact on motivation left larger gaps in their preparedness and they will therefore need extra support on starting work in acute areas.

Discussion

Our participant healthcare undergraduates and their faculty have provided rich explanations of what has worked and not worked in their training during the COVID-19 pandemic to make them ready for practice. We have used these explanations to confirm and develop prior theories about how the adjustments to clinical skills learning and placement activities were expected to work. The prior theories were largely supported. Clinical preparedness in a pandemic is however a complex and still-developing area of educational theory, for which we are not claiming to have produced a complete set of final programme theories. Rather, our study's main findings develop several areas of theory.

Firstly, we were able to confirm that learning basic technical skills in a socially distanced way worked when it followed the four-step process of learning a skill (Giacomino et al., 2020) (see figure 1). From faculty and student explanations of what worked and didn't work in the many adjustments to socially-distanced skills teaching, a theory of how this worked best was developed.

The demonstration could be by (high enough quality) video unless it was for skills involving manual handling prevalent in physiotherapy when students benefit from acting as a model to feel the patient's

experience of being handled. The step 2 explanation could also be delivered remotely, and the benefit of step 1 and 2 being remote was that this enabled learner pacing of delivery and re-running. What didn't work was too long a gap between step 1 and 2 and step 4. Also if step 4 comprised a single simulated attempt only, or if step 4 was directly on a real patient this made the learner feel anxious and unprepared. The main explanation for this was the omission of corrective feedback on first attempts. Student participants reported discovering that they were performing skills incorrectly (with the potential for future dangerous practice) or lacked confidence in their performance.

Peer examination was a successful way of learning systems examinations for medical students but was again inadequate for physiotherapy students. This was because when tutors were not permitted to touch students due to social distancing, student 'bubbles' were poor substitutes for tutor demonstration and could be disrupted by frequent 2-week self-isolation spells as alternative pairings were not permitted. The demonstration and corrective feedback steps of the learning process were impaired.

Deliberate practice is known to be necessary for the acquisition of expert performance (Ericsson, 2004). What our findings highlight is the importance of close observation and corrective feedback at the initial stages of deliberate practice. Simulated clinical scenarios worked well for this when authentic enough as a representation of the clinical workplace as found in previous studies (Almohammed et al., 2021; Jiménez-Rodríguez et al., 2020; Kasai et al., 2021) but were unable to replicate everything that students felt they needed in order to be clinically prepared, so placement practice was also necessary. Paper/online cases with discussion didn't work so effectively for developing clinical expertise because they didn't involve performing the skills.

The main findings from participants' experiences of clinical placements during COVID-19 may be relevant to ensuring preparedness in the context of any future similar pandemic. There are some explanations of why interventions worked or didn't work which can be transferred to future healthcare professional training.

Participants explained being useful on placements was good preparation for practice as being given responsibility triggered a transition in their thinking to a more professional and team-oriented approach. The same mechanisms are likely to have operated in other studies of pandemic volunteering and deployment (Ali et al., 2021; Chawłowska et al., 2021; Coster et al., 2022) Getting the job done was a challenge which caused them to draw on their knowledge and use decision-making processes which they could see they require after qualification. If there was checking and rectifying feedback from supervisors this felt like the best preparation possible and created a high level of confidence.

Participant explanations from junior students about the value of various modes of induction to clinical workplace activity may also be relevant post-pandemic. The clinical environment is quite alien but does not wait for the student to catch up and does not permit much asking of questions, so equipping of students with some knowledge and basic skills enabled them to make better use of their first placements.

As student numbers increase, placements in clinical workplaces will be fewer per student and are being supplemented by virtual placements. These can be oriented towards preparation for clinical placements, and the first clinical placement should be early to help the learning to 'click' and have meaning. The challenge to faculty in attempting to increase simulated practice to replace placements should be noted. Because of the constraints on space and clinical tutor numbers, the initial programme theory that increased clinical skills learning and practicing by simulation would mitigate for some of the lost clinical placement practice was not borne out in reality. Some programmes managed to maintain the same level of simulated practice as previously while others delivered less than usual due to social distancing rules and pandemic conditions. Going forward the context will be different but increasing simulation will need resourcing.

These findings resulted in recommendations for future developments in clinical skills teaching and learning (figure 2).

The strengths of this study are its use of the realist approach to explain why various interventions worked or did not work for different groups of healthcare students. Drawing on the explanations of both students and their clinical supervisors and teachers has also strengthened the CMOcs.

The limitations of this study are evident when looking at the diversity of experience of healthcare students as described by our 51 participants. They were interviewed at the height of the pandemic and were unable to predict future outcomes which will require further study. In describing what seemed important to them they have shone a light into only parts of their professional courses and only parts of the local healthcare placements for a single UK University. There are doubtless other contexts which will have produced other outcomes in other parts of the UK and across the world. For institutions which have similar contexts, however, the same interventions are likely to trigger the same mechanisms with similar outcomes.

Conclusion

To provide the NHS with a safe and effective workforce, it is important that we understand how effective the learning strategies employed during the COVID-19 pandemic have been and to understand across a broad spectrum of people, why they worked (or not). Our findings provide some useful context-specific explanations which can be drawn on in a future pandemic.

Successful innovations such as hybrid learning of skills and induction including virtual placements may be useful even after the pandemic in training the increasing numbers of healthcare professional students being recruited while the clinical workplace has limited placement capacity for them. Through understanding what strategies work for who, and why, it may be possible to train successfully in a more flexible working environment.

Declarations

Competing Interests: none

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Figures

Figure 1: Payton's four step process of learning a skill

Step 1. Demonstration

Step 2. Explanation

Step 3. Learners rehearse mentally by teach-back

Step 4. Learners have a go with corrective feedback

Figure 1

See image above for figure legend.

Figure 2 Recommendations for practice

- Hybrid learning of clinical skills with videos and explanations for self-study of the skill followed by in-person practice and feedback enables students to learn the skills thoroughly and be better prepared to try the skill
- Use formal induction information and basic skills simulation to prepare students for the placement environment
- Making healthcare students useful triggers a change in attitude and thinking towards that of the professional and should be incorporated into training programmes with appropriate supervision.
- The gaps in preparation for practice of pandemic students are so variable between students depending on what placements they did and whether they were deployed, volunteered or stayed at home, that their employers will need to conduct a personalised assessment to identify remediation for each individual to ensure the future NHS healthcare workforce.

Figure 2

See image above for figure legend.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Appendix1Topicguide.docx](#)
- [Appendix2ClinicalandPlacementCMOcs.xlsx](#)